Spatial and Temporal Distributions of Mercury and Methylmercury in Surface Waters Across the Hells Canyon Complex, Snake River, Idaho and Oregon

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Three decades of research on environmental mercury (Hg) contamination has redefined its sources, transport modes and pathways, important processes, and toxicity to wildlife, fish and humans. However, several science gaps remain, including how Hg cycles in deep western US reservoirs. Recent concerns for elevated levels of Hg in sport fish from the Hells Canyon reach of the Snake River triggered a limited assessment of Brownlee Reservoir in May 2012. Results from that effort revealed several unexpected observations, including methylmercury (MeHg) concentrations surficial sediment ranging from 5 to 25 ng/g. Subsequent to this assessment, the USGS and Idaho Power initiated a more detailed, multi-year study of the fundamental factors causing elevated levels of MeHg in surface waters, bottom sediments, and the food web of the Hells Canyon Complex (HCC) – a series of three contiguous hydroelectric reservoirs (Brownlee, Oxbow, and Hells Canyon) along the Snake River. This presentation will focus on describing the spatial and temporal results of surface waters of the HCC.

A primary objective of the ongoing HCC Mercury project is to understand the relative importance of external versus internal sources of MeHg. To answer this question, we sampled inflowing and outflowing surface waters monthly across the HCC, as well as detailed vertical sampling of the water column within each reservoir. Our results suggest a strong decoupling between the epilimnion and hypolimnion during stratified times of the year (~mid-May to mid-December), resulting in their functioning as two, largely independent water masses. Total Hg and MeHg in the epilimnion appear to mimic the inflowing waters from the Snake River, with maximum concentrations observed during peak runoff. The hypolimnion shows a significantly delayed temporal trend in total Hg and MeHg, with peak concentrations observed during fall just before turnover. Detailed water column sampling suggests that hypolimnetic MeHg is being produced in the water column and bottom sediments is the largest pool of MeHg in the system by the end of stratification.